

Title (en)
COMPOUND SEMICONDUCTOR WAFER, PHOTOELECTRIC CONVERSION ELEMENT, AND METHOD FOR PRODUCING GROUP III-V
COMPOUND SEMICONDUCTOR SINGLE CRYSTALS

Title (de)
VERBINDUNGSHALBLEITERWAFER, FOTOELEKTRISCHES UMWANDLUNGSELEMENT UND VERFAHREN ZUR HERSTELLUNG EINES
GRUPPE-III-V-VERBINDUNGSHALBLEITER-EINKRISTALLS

Title (fr)
TRANCHE SEMI-CONDUCTRICE COMPOSITE, ÉLÉMENT DE CONVERSION PHOTOÉLECTRIQUE ET PROCÉDÉ DE PRODUCTION DE
MONOCRISTAUX DE SEMI-CONDUCTEUR COMPOSITE DU GROUPE III-V

Publication
EP 2982783 A4 20170104 (EN)

Application
EP 14773825 A 20140311

Priority
• JP 2013063145 A 20130326
• JP 2014056229 W 20140311

Abstract (en)
[origin: EP2982783A1] In this photoelectric conversion element wherein group III-IV compound semiconductor single crystals containing zinc as an impurity are used as a substrate, the substrate is increased in size without lowering conversion efficiency. A heat-resistant crucible is filled with raw material and a sealant, and the raw material and sealant are heated, thereby melting the raw material into a melt, softening the encapsulant, and covering the melt from the top with the encapsulant. The temperature inside the crucible is controlled such that the temperature of the top of the encapsulant relative to the bottom of the encapsulant becomes higher in a range that not equal or exceed the temperature of bottom of the encapsulant, and seed crystal is dipped in the melt and pulled upward with respect to the melt, thereby growing single crystals from the seed crystal. Thus, a large compound semiconductor wafer that is at least two inches in diameter and has a low dislocation density of $5,000 \text{ cm}^{-2}$ can be obtained, despite having a low average zinc concentration of $5 \times 10^{-17} \text{ cm}^{-3}$ to $3 \times 10^{-18} \text{ cm}^{-3}$, at which a crystal hardening effect does not manifest.

IPC 8 full level
C30B 29/42 (2006.01); **C30B 15/04** (2006.01); **C30B 15/20** (2006.01); **C30B 15/22** (2006.01); **C30B 15/30** (2006.01); **C30B 27/02** (2006.01); **C30B 29/40** (2006.01); **H01L 31/0304** (2006.01); **H01L 31/0735** (2012.01); **H01L 31/18** (2006.01)

CPC (source: EP US)
C30B 15/04 (2013.01 - EP US); **C30B 15/20** (2013.01 - US); **C30B 15/203** (2013.01 - EP US); **C30B 15/22** (2013.01 - EP US); **C30B 15/30** (2013.01 - EP US); **C30B 27/02** (2013.01 - EP US); **C30B 29/40** (2013.01 - EP US); **C30B 29/42** (2013.01 - EP US); **H01L 31/03042** (2013.01 - US); **H01L 31/0735** (2013.01 - EP US); **H01L 31/184** (2013.01 - EP US); **Y02E 10/544** (2013.01 - EP US); **Y02P 70/50** (2015.11 - EP US)

Citation (search report)
• [X] US 2009072205 A1 20090319 - KAWASE TOMOHIRO [JP]
• [X] EP 0251458 A2 19880107 - AMERICAN TELEPHONE & TELEGRAPH [US]
• [A] JP H06227898 A 19940816 - SUMITOMO ELECTRIC INDUSTRIES
• [A] JP H04280447 A 19921006 - SUMITOMO ELECTRIC INDUSTRIES
• [A] US 4645560 A 19870224 - MATSUMOTO KAZUHISA [JP], et al
• [X] CLEMANS J E ET AL: "BULK III-V COMPOUND SEMICONDUCTOR CRYSTAL GROWTH", AT & T TECHNICAL JOURNAL, AMERICAN TELEPHONE AND TELEGRAPH CO. NEW YORK, US, vol. 68, no. 1, 1 January 1989 (1989-01-01), pages 29 - 42, XP000103192, ISSN: 8756-2324
• [I] HIRANO R ET AL: "Reduction of dislocation densities in InP single crystals by the LEC method using thermal baffles", JOURNAL OF ELECTRONIC MATERIALS, SPRINGER US, BOSTON, vol. 25, no. 3, 1 March 1996 (1996-03-01), pages 347 - 351, XP035178062, ISSN: 1543-186X, DOI: 10.1007/BF02666600
• See references of WO 2014156596A1

Designated contracting state (EPC)
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

DOCDB simple family (publication)
EP 2982783 A1 20160210; **EP 2982783 A4 20170104**; CN 105247117 A 20160113; CN 108977888 A 20181211; EP 3828319 A1 20210602; EP 4119703 A1 20230118; JP 2018083754 A 20180531; JP 6300786 B2 20180404; JP 6749309 B2 20200902; JP WO2014156596 A1 20170216; TW 201448246 A 20141216; TW I518930 B 20160121; US 11211505 B2 20211228; US 11349037 B2 20220531; US 2016043248 A1 20160211; US 2018102446 A1 20180412; WO 2014156596 A1 20141002

DOCDB simple family (application)
EP 14773825 A 20140311; CN 201480030086 A 20140311; CN 201810941688 A 20140311; EP 20217266 A 20140311; EP 22188569 A 20140311; JP 2014056229 W 20140311; JP 2015508250 A 20140311; JP 2017233257 A 20171205; TW 103111029 A 20140325; US 201414780333 A 20140311; US 201715837971 A 20171211